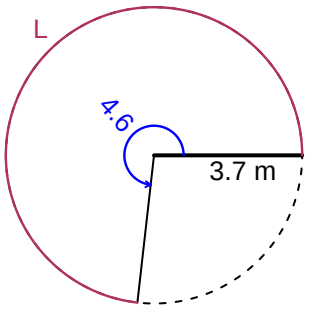
Name: Date:

Trig Final (Solution v26)

- You can use a calculator (like Desmos)
- You should have a unit-circle with special angles and coordinates marked.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The radius is 3.7 meters. The angle measure is 4.6 radians. How long is the arc in meters?

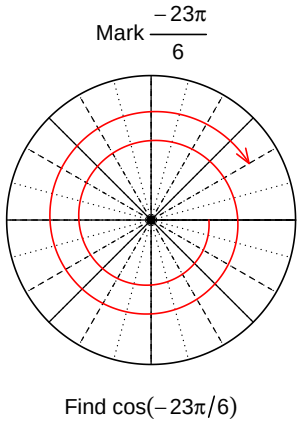


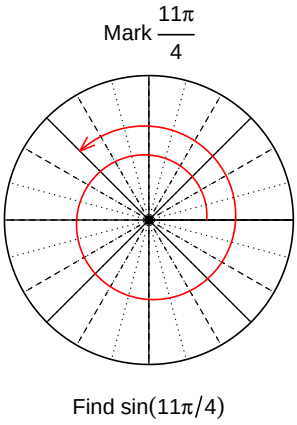
$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

$L = 17.02$ meters.

Question 2

Consider angles $\frac{-23\pi}{6}$ and $\frac{11\pi}{4}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\cos\left(\frac{-23\pi}{6}\right)$ and $\sin\left(\frac{11\pi}{4}\right)$ by using a unit circle (provided separately).





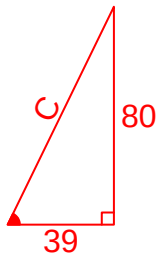
$\cos(-23\pi/6) = \frac{\sqrt{3}}{2}$

$\sin(11\pi/4) = \frac{\sqrt{2}}{2}$

Question 3

If $\tan(\theta) = \frac{-80}{39}$, and θ is in quadrant II, determine an exact value for $\sin(\theta)$.

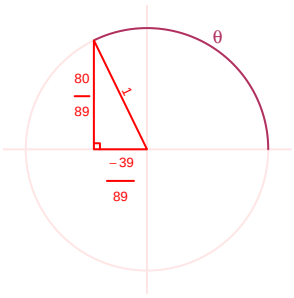
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$39^2 + 80^2 = C^2$$
$$C = \sqrt{39^2 + 80^2}$$
$$C = 89$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant II in a unit circle.



$$\sin(\theta) = \frac{80}{89}$$

Question 4

A mass-spring system oscillates vertically with a frequency of 4.54 Hz, a midline at $y = -7.62$ meters, and an amplitude of 6.36 meters. At $t = 0$, the mass is at the minimum height. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = -6.36\cos(2\pi 4.54t) - 7.62$$

or

$$y = -6.36\cos(9.08\pi t) - 7.62$$

or

$$y = -6.36\cos(28.53t) - 7.62$$